

CLAIMS

1. An apparatus comprising:

a pusher movable from a retracted position to an extended position for inserting a slider onto a first section of a zipper comprising mutually interlockable first and second zipper strips;

5 first and second guides disposed on opposite sides of a second section of said zipper;

first and second grippers respectively disposed on opposite sides of a third section of said zipper disposed between said first and second sections, each of said first and second grippers being movable between
10 respective extended and retracted positions to grip said zipper when said grippers are in said extended positions and to not grip said zipper when said grippers are not in said extended positions;

third and fourth grippers respectively disposed on opposite sides of a fourth section of said zipper, said first sections being disposed between
15 said third and fourth sections, each of said third and fourth grippers being movable between respective extended and retracted positions to grip said zipper when said grippers are in said extended positions and to not grip said zipper when said grippers are not in said extended positions; and

a splitter plate disposed between said first and second zipper
20 strips along said second and third sections.

2. The apparatus as recited in claim 1, further comprising a channel for said pusher, said channel comprising first and second sidewalls, said first and second sidewalls of said pusher channel being mutually parallel, wherein said first and third grippers have interior surfaces generally coplanar
25 with said first channel sidewall, and said second and fourth grippers have interior surfaces generally coplanar with said second channel sidewall.

3. The apparatus as recited in claim 1, wherein said splitter plate comprises a first groove facing said first guide and a second groove facing said second guide, said first and second grooves being aligned with a machine direction, said first zipper strip along said second and third sections of said zipper being seated in said first groove, and said second zipper strip along said second and third sections of said zipper being seated in said second groove.

4. The apparatus as recited in claim 1, wherein each of said first through fourth grippers comprises a textured end face that contacts said zipper when said first through fourth grippers are in their respective extended positions.

5. The apparatus as recited in claim 4, wherein said textured end faces of said first and second grippers each comprise a respective plurality of mutually parallel ridges aligned with a cross direction.

6. The apparatus as recited in claim 4, wherein said textured end faces of said third and fourth grippers each comprise a respective plurality of mutually parallel ridges aligned with a machine direction.

7. The apparatus as recited in claim 1, wherein said first and third grippers are fixed relative to each other and move in unison, and said second and fourth grippers are fixed relative to each other and move in unison.

8. The apparatus as recited in claim 1, wherein each of said first through fourth grippers comprises a respective end face that contacts said zipper when said first through fourth grippers are in their respective extended positions, said end faces of said first and second grippers being separated by a first distance and said end faces of said third and fourth grippers being separated by a second distance less than said first distance when said first through fourth grippers are in their respective extended positions.

9. The apparatus as recited in claim 1, further comprising a first cylinder for moving said first and third grippers, a second cylinder for moving said second and fourth grippers, and a third cylinder for moving said pusher.

5 10. The apparatus as recited in claim 9, further comprising a controller programmed to control said first, second and third cylinders so that said slider is inserted only while said grippers are in their respective extended positions.

10 11. The apparatus as recited in claim 10, wherein said controller is programmed to control said first and second cylinders so that said first through fourth grippers move from their respective retracted positions to their respective extended positions in unison.

15 12. The apparatus as recited in claim 10, further comprising means for advancing said zipper, wherein said controller is programmed to control said advancing means and said first, second and third cylinders so that said zipper is advanced while said grippers and said pusher are in their respective retracted positions.

20 13. The apparatus as recited in claim 1, wherein said pusher comprises a base that bears against a top wall of said slider, and a side wall that contacts a side wall of said slider, said side wall of said pusher having an angled interior surface that is not perpendicular to said base of said pusher.

14. A slider insertion machine comprising:

a pusher movable from a retracted position to an extended position for inserting a slider into a predetermined volume of space and onto a zipper that spans said predetermined volume of space; and

25 first and second clamps respectively disposed on opposite sides of said zipper, each of said first and second clamps being movable between respective extended and retracted positions to clamp said zipper on opposite sides of said predetermined volume of space when said clamps are in said

extended positions and to not clamp said zipper when said clamps are not in said extended positions.

5 15. The machine as recited in claim 14, wherein each of said first and second clamps is generally U-shaped and straddles a respective portion of said predetermined volume of space when said clamps are in said extended positions.

10 16. The machine as recited in claim 15, further comprising a plate disposed between first and second zipper strips of said zipper, wherein said first clamp comprises first and second arms connected by a first cross member and having respective end faces, said second clamp comprises third and fourth arms connected by a second cross member and having respective end faces that oppose the respective end faces of said first and second arms, and said plate has a distal portion disposed in a space between said opposing end faces of said first and third arms.

15 17. The machine as recited in claim 16, wherein said plate has first and second grooves on opposing sides thereof and aligned with a machine direction, a first portion of said first groove facing said end face of said first arm and a first portion of said second groove facing said end face of said third arm.

20 18. The machine as recited in claim 17, further comprising first and second guides disposed on opposite sides of a proximal portion of said plate, a second portion of said first groove facing said first guide and a second portion of said second groove facing said second guide.

19. The machine as recited in claim 16, wherein said end faces of said first through fourth arms have textured surfaces.

25 20. The machine as recited in claim 19, wherein said textured end faces of said first and third grippers each comprise a respective plurality of mutually parallel ridges aligned with a cross direction.

21. The machine as recited in claim 19, wherein said textured end faces of said second and fourth grippers each comprise a respective plurality of mutually parallel ridges aligned with a machine direction.

5 22. The machine as recited in claim 16, wherein said first arm is longer than said second arm, and said third arm is longer than said fourth arm.

23. The machine as recited in claim 16, further comprising a first cylinder for moving said first clamp, a second cylinder for moving said second clamp, and a third cylinder for moving said pusher.

10 24. The machine as recited in claim 16, further comprising a channel for said pusher, said channel comprising first and second sidewalls, said first and second sidewalls of said pusher channel being mutually parallel, wherein said first clamp has one interior surface generally coplanar with said first channel sidewall and another interior surface generally coplanar with said second channel sidewall, and said second clamp has one interior surface
15 generally coplanar with said first channel sidewall and another interior surface generally coplanar with said second channel sidewall.

25. A method of inserting a slider onto continuous zipper material, comprising the following steps:

20 (a) opening a section of zipper material by disengaging first and second zipper strips from each other;

(b) clamping a first portion of said first zipper strip against one side of a plate, said first portion of said first zipper strip forming part of said open section of said zipper and being disposed on one side of a slider insertion zone;

25 (c) clamping a first portion of said second zipper strip against an opposite side of said plate, said first portion of said second zipper strip forming part of said open section of said zipper and being disposed on said one side of said slider insertion zone;

(d) clamping a second portion of said first zipper strip against a second portion of said second zipper strip, said second portions of said first and second zipper strips forming a closed section of said zipper and being disposed on an opposite side of said slider insertion zone; and

5 (e) inserting a slider onto said zipper in said slider insertion zone, with a plow of said slider being disposed between respective third portions of said first and second zipper strips, wherein step (e) is performed after steps (a) through (d).

10 26. The method as recited in claim 25, wherein step (a) comprises advancing said section of said zipper material while a leading edge of a stationary splitter plate pries said first and second zipper strips apart.

27. The method as recited in claim 26, wherein steps (b) through (d) are performed during a dwell time after said advancement.

15 28. The method as recited in claim 27, further comprising the steps of releasing said first and second portions of said first and second zipper strips, and advancing said zipper material with said inserted slider thereon.

20 29. The method as recited in claim 25, further comprising the steps, performed prior to steps (a) through (e), of joining a first portion of film material to said first zipper strip along said section of said zipper material, and joining a second portion of film material to said second zipper strip along said section of said zipper material.

25 30. The method as recited in claim 29, wherein said first and second zipper strips have substantially no flanges, said first and second portions of film material being joined to respective backs of said first and second zipper strips along said section of said zipper material.

31. A slider insertion machine comprising:

a stationary splitter plate for opening a section of zipper material by disengaging first and second zipper strips from each other;

5 first means for clamping a first portion of said first zipper strip against one side of said splitter plate, said first portion of said first zipper strip forming part of said open section of said zipper and being disposed on one side of a slider insertion zone;

10 second means for clamping a first portion of said second zipper strip against an opposite side of said splitter plate, said first portion of said second zipper strip forming part of said open section of said zipper and being disposed on said one side of said slider insertion zone;

15 third means for clamping a second portion of said first zipper strip against a second portion of said second zipper strip, said second portions of said first and second zipper strips forming a closed section of said zipper and being disposed on an opposite side of said slider insertion zone; and

a pusher for inserting a slider onto said zipper in said slider insertion zone, with a plow of said slider being disposed between respective third portions of said first and second zipper strips.

20 32. The device as recited in claim 31, wherein said pusher is movable between a retracted position whereat said pusher receives a slider and an extended position whereat said slider is inserted on a zipper.

25 33. The device as recited in claim 31, wherein said third clamping means comprise first and second clamping arms that are movable between respective retracted positions, whereat an inserted slider has sufficient clearance to pass through a space between said first and second clamping arms during zipper advancement, and respective extended positions, whereat said second portions of said first and second zipper strips are pressed together.

34. The device as recited in claim 33, wherein said first clamping means comprise a third clamping arm coupled to said first clamping arm, and said second clamping means comprise a fourth clamping arm coupled to said second clamping arm, further comprising a first means for displacing said first and third clamping arms, and a second means for displacing said second and fourth clamping arms.

35. The device as recited in claim 34, wherein said first displacing means comprise a first cylinder, and said second displacing means comprise a second cylinder.

36. The device as recited in claim 31, further comprising first and second guides disposed on opposing sides of said splitter plate, said splitter plate having first and second grooves respectively facing said first and second guides for passage of said first and second zipper strips respectively.

37. A method of inserting a slider onto continuous zipper material, comprising the following steps:

(a) advancing a section of zipper material past a leading edge of a splitter plate that pries first and second zipper strips of said zipper material apart during advancement;

(b) clamping a first portion of said first zipper strip against one side of the splitter plate, said first portion of said first zipper strip being disposed on one side of a slider insertion zone;

(c) clamping a first portion of said second zipper strip against an opposite side of said splitter plate, said first portion of said second zipper strip being disposed on said one side of said slider insertion zone;

(d) closing a portion of said zipper comprising a second portion of said first zipper strip and a second portion of said second zipper strip, said second portions of said first and second zipper strips being disposed on an opposite side of said slider insertion zone; and

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(e) inserting a slider onto said zipper in said slider insertion zone, with a plow of said slider being disposed between respective third portions of said first and second zipper strips, wherein steps (b) through (e) are performed during a dwell time after step (a), and step (e) is performed after steps (b) through (d).

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